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(71) Applicant:  
**Hewlett-Packard Company**  
**Palo Alto, California 94304 (US)**

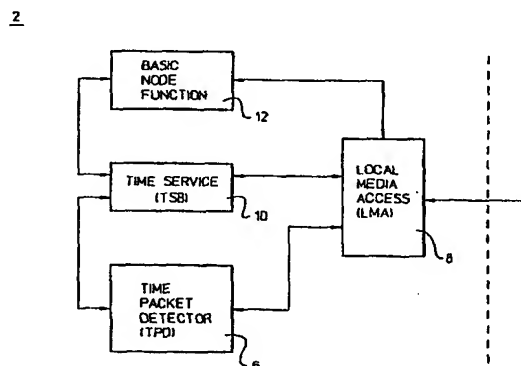
(72) Inventors:  
• **Eidson, John C.**  
**Palo Alto, CA 94303 (US)**  
• **Dara-Abrams, Joseph A.**  
**Los Altos, CA 94024 (US)**

• **Woods, Stanley P.**  
**Santa Clara, CA 95051 (US)**  
• **Cutler, Leonard S.**  
**Los Altos Hills, CA 94022 (US)**  
• **Giffard, Robin P.**  
**Los Altos, CA 94024 (US)**  
• **Johnson, James L.**  
**Scotts Valley, CA 95066 (US)**

(74) Representative:  
**Jehan, Robert et al**  
**Williams, Powell & Associates,**  
**34 Tavistock Street**  
**London WC2E 7PB (GB)**

(54) **Timing in a data communications network**

(57) A data communication network comprises a local clock (22) within a node (2) of the network which may be synchronized and syntonized by any node in the network. Each node contains a time packet detector (6) that detects and recognizes timing data packets and produces a recognition signal. Each node has a time server (10) that includes the local clock (22). The time server records the time of the recognition signal. The recorded time is used for correcting the local clocks of the various nodes (2) in the network. A transfer device such as a gateway, a bridge or a router may include a time server and a time packet detector to correct for the transit time of a time packet through such transfer device. The time packet detector (6) is connected at the point of final encoding for transmission or recovery of the clock and data.



**FIG. 4**

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## EUROPEAN SEARCH REPORT

Application Number  
EP 95 30 9322

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
Y	EP 0 247 026 A (AUSTRIA MIKROSYSTEME INT) 25 November 1987 * column 1, line 35 - line 48 * * column 4, line 17 - line 31 * * column 5, line 1 - line 8; figure 1 * ---	1-13	H04J3/06 G06F1/14
Y	US 4 893 318 A (POTASH RICHARD J ET AL) 9 January 1990 * column 5, line 18 - line 31 * * column 6, line 9 - line 16 * * column 8, line 55 - line 66 * * column 9, line 9 - column 11, line 66 * * figures 1,2,4,6,8 * ---	1-13	
A	SU S ET AL: "Time synchronization and ranging for multihop mobile radio networks" PROCEEDINGS OF IEEE INFOCOM '86. FIFTH ANNUAL CONFERENCE ON 'COMPUTERS AND COMMUNICATIONS INTEGRATION DESIGN, ANALYSIS, MANAGEMENT' (CAT. NO.86CH2284-8), MIAMI, FL, USA, 8-10 APRIL 1986, ISBN 0-8186-0694-0, 1986, NEW YORK, NY, USA, IEEE, USA, pages 636-640, XP002041766 * page 637, left-hand column, paragraph 3 - page 638, left-hand column, paragraph 2 * --- -/-	1-13	<div>TECHNICAL FIELDS SEARCHED (Int.Cl.6)</div> <div>H04J G06F</div>
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 25 September 1997	Examiner Pieper, T
<b>CATEGORY OF CITED DOCUMENTS</b> X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ..... & : member of the same patent family, corresponding document	

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## EUROPEAN SEARCH REPORT

Application Number  
EP 95 30 9322

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	<p>COLE R ET AL: "AN EXPERIMENT IN CLOCK SYNCHRONISATION" COMPUTER JOURNAL, vol. 31, no. 6, 1 December 1988, pages 496-502, XP000068624 * page 496, right-hand column, last paragraph - page 497, left-hand column, paragraph 1 * * page 498, left-hand column, paragraph 4.1 - page 499, left-hand column * * figures 1-3 *</p> <p>---</p>	1-13	
A	<p>HORDEN I: "VERSATILE MICROCONTROLLER FAMILY WORKS IN LOW-COST AND HIGH PERFORMANCE APPLICATIONS" WESCON TECHNICAL PAPERS, vol. 31, 1987, pages 1/4 1-05, XP000004638 * page 3, left-hand column, paragraph 2 - right-hand column, paragraph 1; figure 2 *</p> <p>-----</p>	1,10	
The present search report has been drawn up for all claims			<p>TECHNICAL FIELDS SEARCHED (Int.Cl.6)</p>
Place of search	Date of completion of the search	Examiner	
THE HAGUE	25 September 1997	Pieper, T	
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons</p> <p>..... &amp; : member of the same patent family, corresponding document</p>			

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# (12) UK Patent Application (19) GB (11) 2 364 203 (13) A

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(71) Applicant(s)  
Nokia Mobile Phones Limited  
(Incorporated in Finland)  
Keilalahdentie 4, 02150 Espoo, Finland

(72) Inventor(s)  
Thomas Muller  
Olaf J Joeressen  
Jurgen Schnitzler  
Markus Schetelig

(74) Agent and/or Address for Service  
Nokia IPR Department  
Nokia House, Summit Avenue, Southwood,  
FARNBOROUGH, Hampshire, GU14 0NG,  
United Kingdom

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H4L LDSS L215 L217  
H4P PSB

(56) Documents Cited  
WO 00/38361 A2

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PSB PSEX PSX  
INT CL<sup>7</sup> G04G 7/00 7/02 , H04B 7/26 , H04J 3/06 ,  
H04L 7/00 , H04N 5/04  
Online Databases: WPI, EPODOC, JAPIO

(54) Abstract Title  
**Synchronisation of real time clocks of separate devices**

(57) Devices such as multimedia devices communicating by radio according to the Bluetooth standard are synchronised to a common time reference such as a clock signal producing a repetition of beats or instances. Each device also has a real time clock . A transmitting device acting as a master transmits the value of its real time clock together with an indication of the instance at which the clock was read. A receiving device acting as a slave synchronises its real time clock to that of the master by calculating from the received value and instance, a master real time clock value at a later instance to which it can adjust. Alternatively the transmitter calculates the value of its real time clock at a future instance and transmits the value and future instance to the receiver for it to synchronise to.

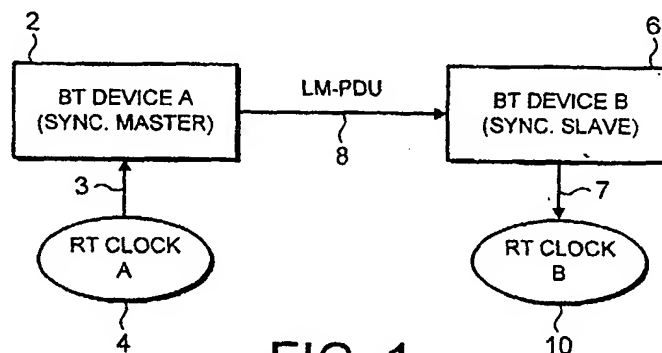


FIG. 1

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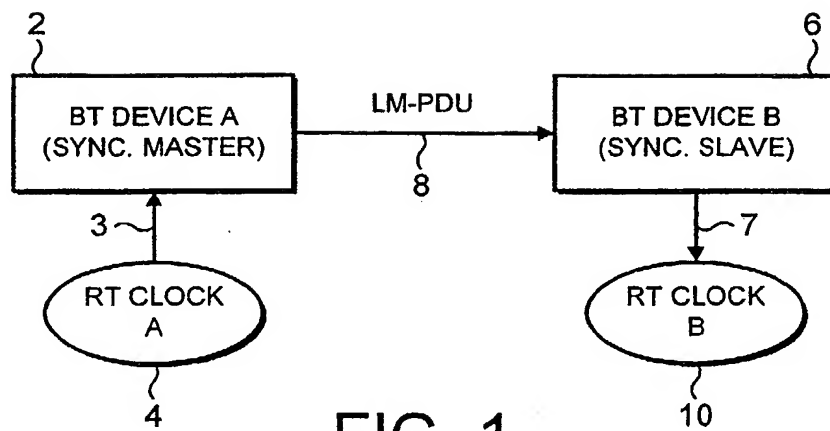


FIG. 1

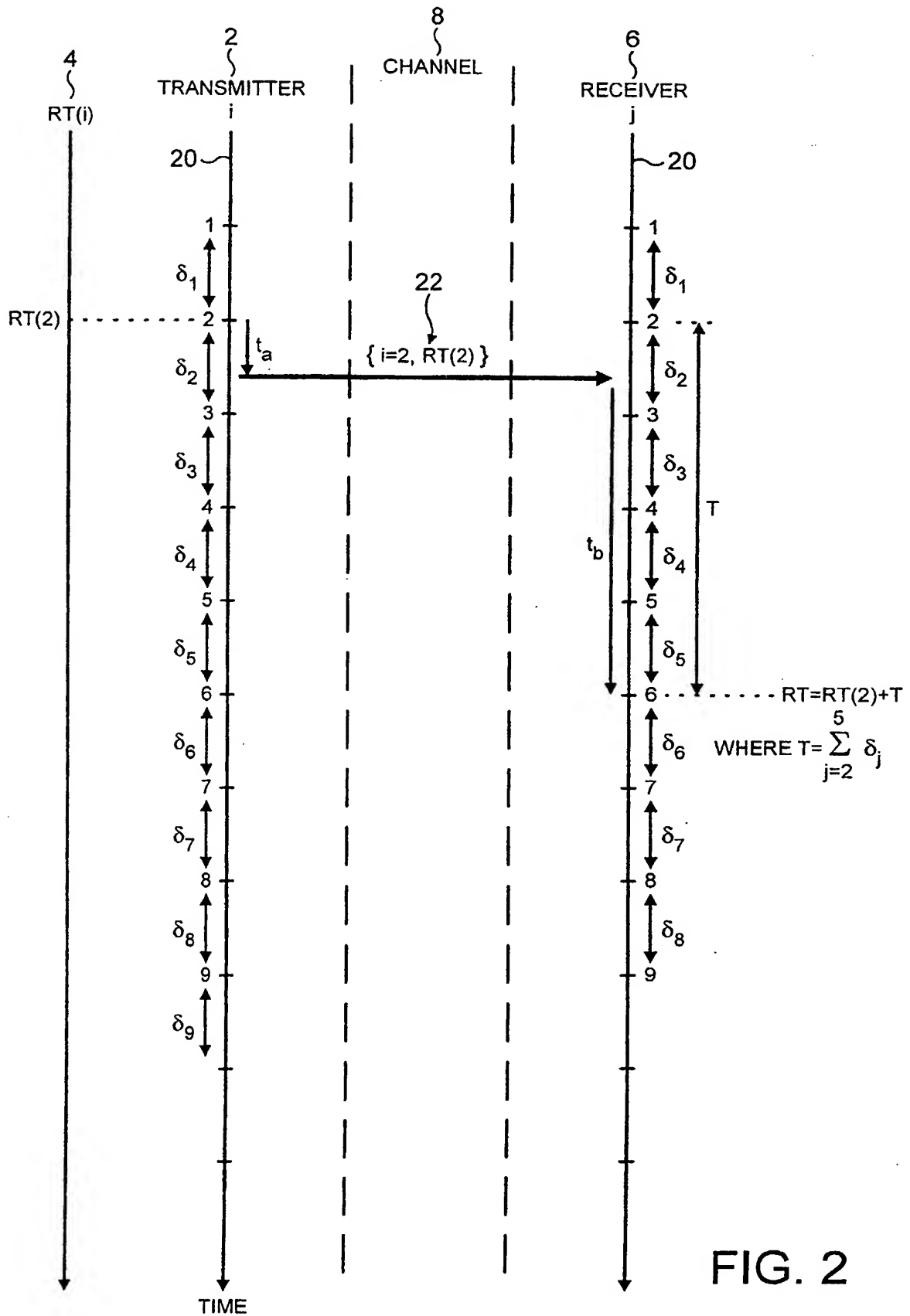


FIG. 2

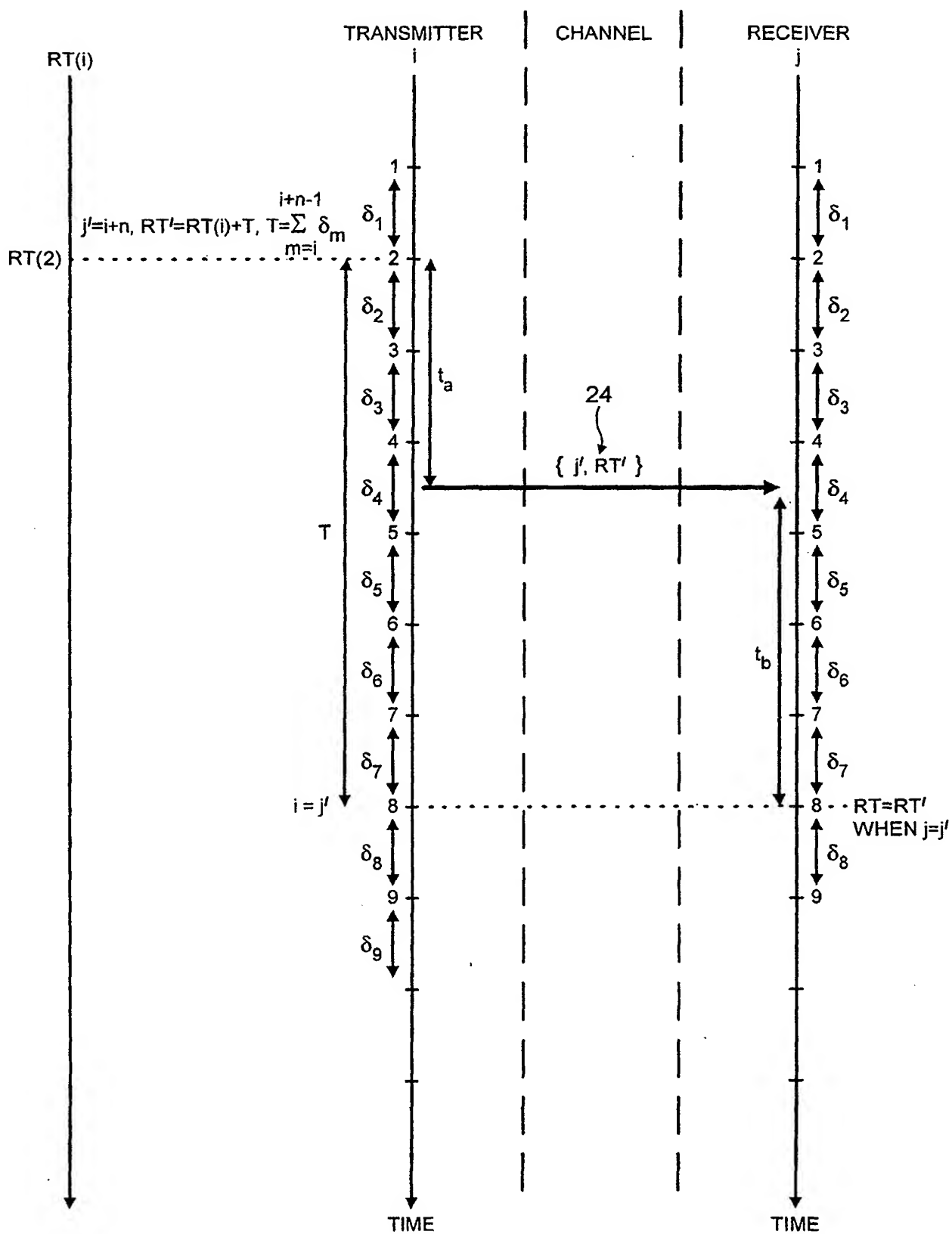


FIG. 3



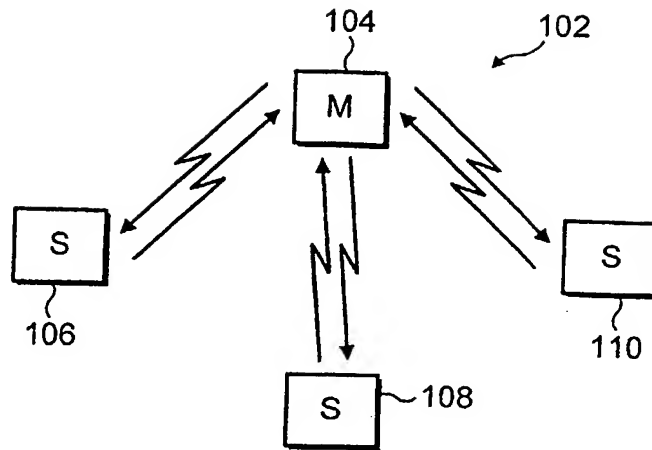


FIG. 4

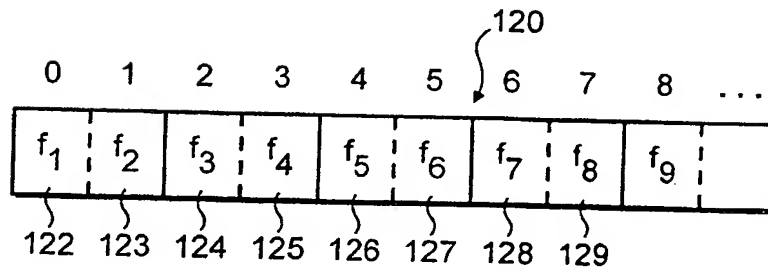


FIG. 5

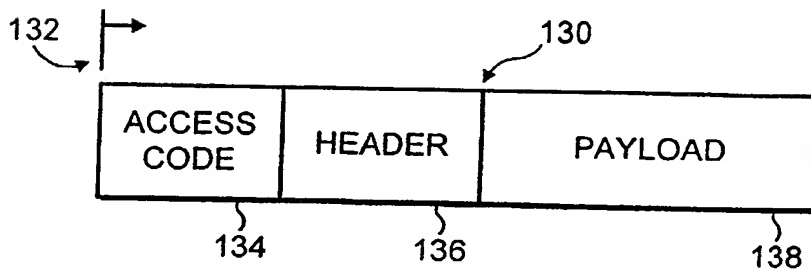


FIG. 6

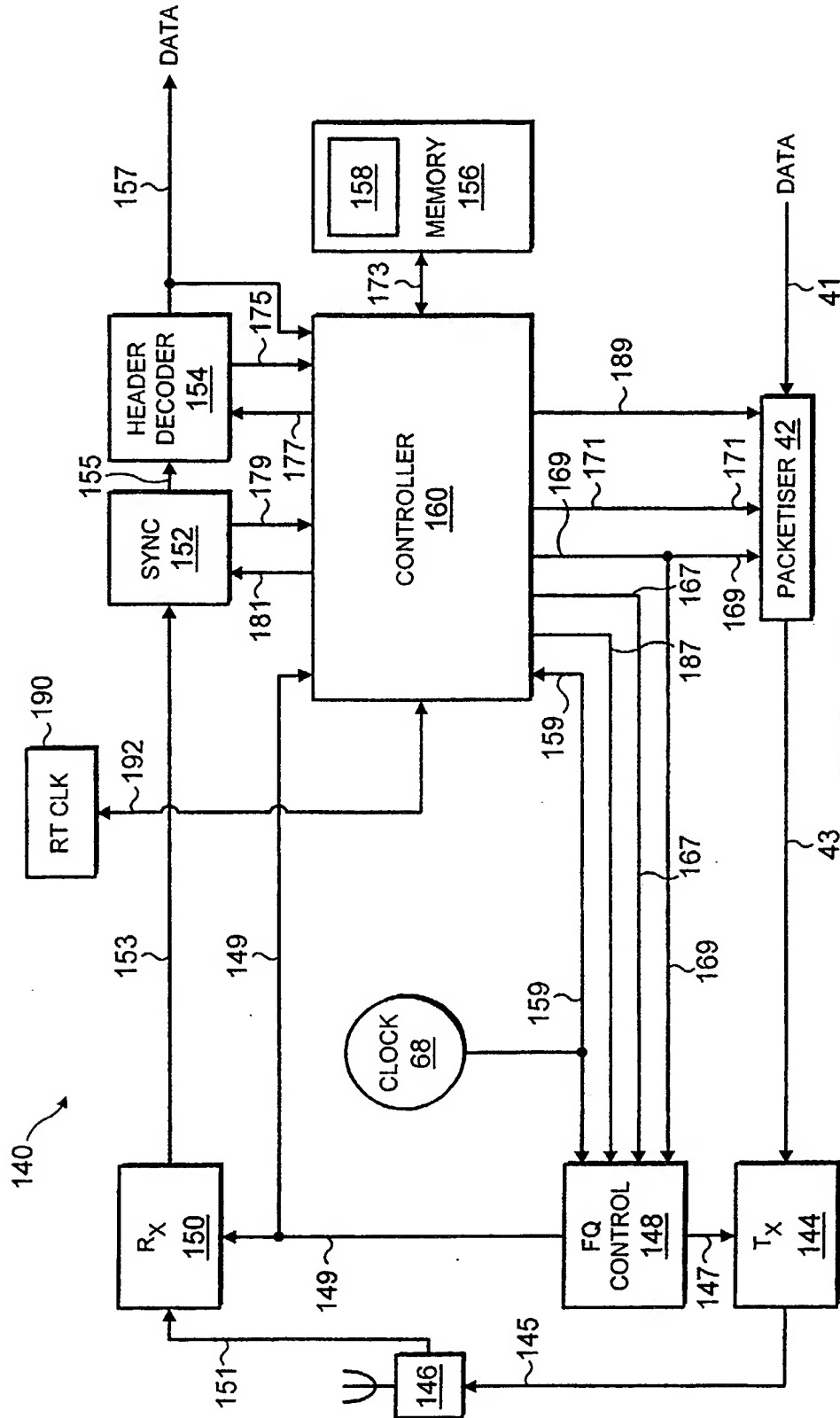


FIG. 7

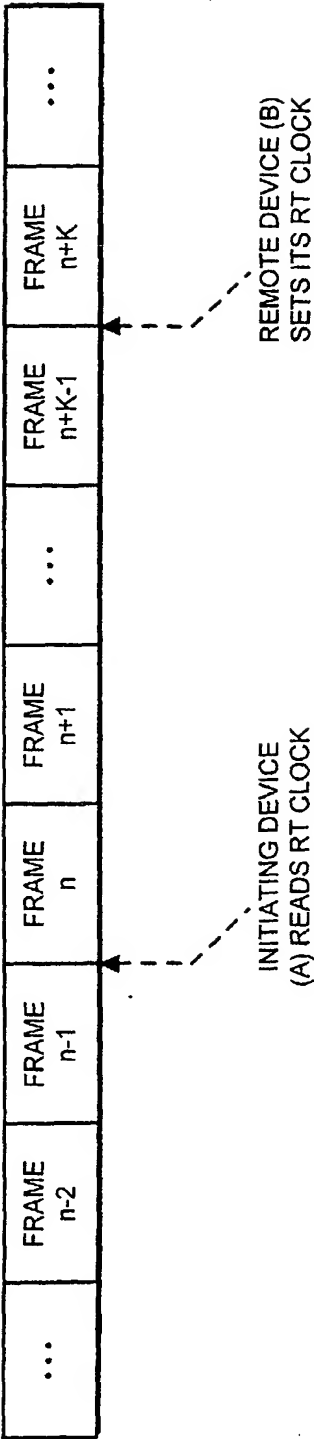


FIG. 8

Synchronisation

- 5 The present invention relates to the synchronisation of Real Time clocks of separate devices. It has particular application for devices communicating according to the Bluetooth Standard.

10 In an increasingly multimedia world, it is important to be able to control the timing of multimedia output so that each of the outputs have the correct timing relative to other events and outputs. If the correct timing is achieved each output will be in real time and will be correctly synchronised with the other outputs.

- 15 If the outputs are distributed in space, however, it may be difficult to establish and maintain synchronicity between the real time clocks associated with each output. This problem is particularly acute when the latencies between the different outputs are unknown or variable.

- 20 This problem applies equally to multimedia inputs and maintaining the synchronism between them.

25 An exemplary scenario in which the problem comes to the fore is in a surround sound video application in which multiple audio outputs are synchronised to the video output. During recording and playback the different media streams (audio and video) need to be adjusted with respect to a certain time reference.

- 30 It would be desirable to address the above mentioned problem of synchronisation.